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ABC of obesity Childhood obesity

John J Reilly, David Wilson

Obesity, an excessive body fat content with increased risk of morbidity, has become increasingly common in children and adolescents. Confusion exists, however, over basic questions such as whether paediatric obesity matters, how to diagnose it, and whether it should be treated (and if so, how best to do this). Doctors in many fields need a better understanding of these issues.

Diagnosis

Subjective assessment methods are inaccurate, so diagnosis must be objective. A substantial and consistent body of high quality evidence has shown that body mass index (BMI; weight in kilograms divided by height in metres squared) can be used to diagnose obesity effectively.

BMI is lower in childhood and adolescence than in adulthood and differs between boys and girls. Clinically, no diagnostic alternative exists, therefore, to considering BMI in an age and sex specific manner, either by plotting it on a BMI chart or by referring to tables of BMI for age and sex.

In the United Kingdom, BMI for age charts represent the distribution of BMI in children in 1990. Diagnosing obesity as a high BMI centile (such as the 98th centile or above on the UK charts) identifies the fattest children in the population with high specificity (low false positive rate). High specificity provides confidence that a child diagnosed as obese in this way actually is excessively fat, and not simply muscular. In addition, strong evidence shows that children with a high BMI centile are at high risk of comorbid conditions, so the diagnosis is clinically meaningful.

For comparisons of obesity prevalence between nations, "international" definitions of overweight and obesity based on BMI for age are available. These are designed to provide definitions that are conceptually equivalent to adult BMI values of 25 and 30 respectively.

Despite high specificity for excess fatness, a high BMI for age has only modest sensitivity in children and adolescents (moderate false negative rate). Modest sensitivity is a problem for public health applications such as surveillance of obesity, as estimates of prevalence of obesity based on BMI tend to be conservative.

Future research may provide useful diagnostic alternatives to BMI, and the use of waist circumference in the paediatric age range is promising, though not yet sufficiently evidence based.

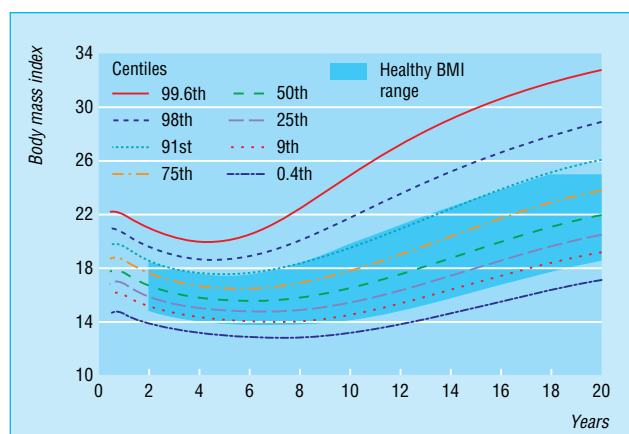
Prevalence

In the UK the epidemic of paediatric obesity began in the late 1980s. Prevalence has continued to increase rapidly, and obesity is now the most common disorder of childhood and adolescence. The health survey for England 2004 showed that 14% of 2-11 year olds and 25% of 11-15 year olds were obese (BMI \geq 95th centile).

In the United States, prevalence of childhood obesity is highest in some ethnic minority groups; preliminary evidence suggests that this might also be the case in Europe, although further research is necessary and will require oversampling of children and adolescents from ethnic minority groups.

This is the 11th article in the series

This article summarises recent evidence based clinical guidelines and systematic reviews and proposes strategies for managing paediatric obesity



Simplified diagram of some body mass index curves seen on UK BMI charts for boys (that for girls is similar). The charts are available from Harlow Health via the Child Growth Foundation (www.childgrowthfoundation.org)

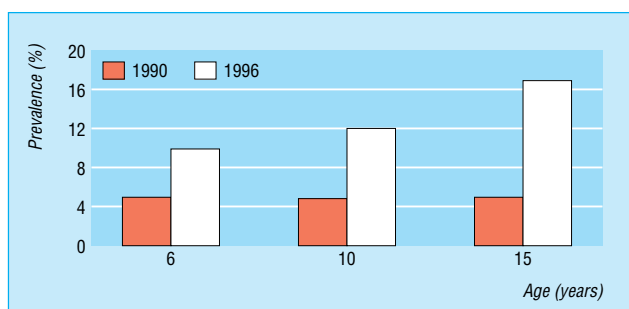
Evidence based definitions of paediatric obesity

For research and epidemiological purposes

- Overweight should be defined as BMI \geq 85th centile for sex and age
- Obesity should be defined as BMI \geq 95th centile for sex and age

For clinical purposes in UK

- Overweight should be defined as BMI \geq 91st centile if using the UK BMI charts
- Obesity should be defined as BMI \geq 98th centile if using the UK BMI charts



Development of epidemic of obesity in English children during the 1990s. Adapted from Reilly et al (*Lancet* 1999;354:1874-5)

Excess obesity is a particularly important clinical issue in certain ethnic groups, such as South Asians. South Asians are more sensitive to the adverse effects of excess weight gain and account for most childhood cases of type 2 diabetes in the UK.

Consequences of childhood obesity

A systematic review and critical appraisal recently concluded that paediatric obesity was a major health burden not only in childhood and adolescence but also later on, in adulthood.

Short term

Many obese patients seeking medical care experience teasing and bullying and will have low self esteem or a poor quality of life. Paediatric obesity is also associated with many other comorbid conditions. Evidence on some important comorbidities (such as liver disease) and on the adverse economic effects of paediatric obesity has only emerged recently, and the list of adverse consequences will lengthen in the near future.

From a public health viewpoint the most serious consequence of obesity in childhood may be its damaging long term effects on individuals' cardiovascular health. Cardiovascular risk factors are common, particularly in obese adolescents, and tend to "cluster" (aggregate) in obese individuals. For example, in a non-clinical sample of adolescents in the United States, 29% of those who were obese had the metabolic syndrome compared with 0.1% of those who were not overweight.

Long term

Evidence linking childhood obesity to adult disease and premature mortality is difficult to obtain and is currently limited. However, systematic review and critical appraisal is supportive of the hypothesis that paediatric obesity has adverse effects on health in adulthood.

Obesity tends to persist, particularly from adolescence into adulthood. Children are least likely to "grow out of" obesity when it is more severe and when they have at least one obese parent, and both of these features are much more common now than in the past. These days, at least 60% of obese children and 70-80% of obese adolescents are likely to become obese adults.

Prevention

The evidence on interventions for prevention has recently been reviewed systematically and critically appraised. Few randomised controlled trials have been conducted. Most trials were found to be methodologically weak and short term, and most of the interventions tested were unlikely to be generalisable.

Few trials found benefits linked to the intervention being tested. One notable exception, however, is the "Planet Health" intervention in US schoolchildren, which was of high methodological quality, reasonably long term, generalisable, and successful (at least in girls). The success of this particular intervention was attributed largely to reductions in television viewing.

Further research on preventive interventions is needed urgently. A helpful guide to preventive interventions was proposed by Whitaker. One barrier to such interventions is the common perception among parents, teachers, and health professionals that the interventions may cause harm (for example, by promoting eating disorders). Such adverse effects are extremely unlikely.

Obesity is more common in older children and adolescents than in younger children; in the developed world it is slightly more common in children from less affluent families, for reasons that are unclear

Consequences of paediatric obesity

Short term (for the child or adolescent)

- Psychological ill health
- Cardiovascular risk factors
- Asthma
- Chronic inflammation
- Diabetes (type 1 and 2)
- Orthopaedic abnormalities
- Liver disease

Long term (for the adult who was obese as a child or adolescent)

- Persistence of obesity
- Adverse socioeconomic outcomes, particularly in women
- Cardiovascular risk factors, diabetes, cancers, depression, arthritis
- Premature mortality



Obesity in adolescence, particularly in girls, is associated with impaired adult socioeconomic outcomes such as poorer educational results and lower income

"Planet Health" trial*

Intervention

- Was conducted over two school years; 1295 participants aged 11 years at baseline
- Aimed to reduce television viewing, increase lifestyle physical activity, reduce fat intake, and increase fruit and vegetable intake
- Intervention was tested rigorously in a high quality randomised trial
- Intervention is probably generalisable
- Assessment of economic impact was carried out

Outcomes

- School based changes were sustainable and cost effective
- Benefits to intervention were found in girls (reduced risk of becoming obese, remission of existing obesity)
- Benefits were attributed to reductions in television viewing

*Trial of model programme for school based obesity prevention (further details from Gortmaker et al. *Arch Pediatr Adolesc Med* 1999;151:409-15)

Guide to prevention interventions*

Interventions should:

- Do no harm
- Lead to benefiting child health or development in other ways
- Target behaviours that are causally related to the development of obesity or to its maintenance
- Target behaviours that are modifiable
- Target behaviours that are measurable because (a) families would otherwise find it difficult to make changes and (b) scientific evaluation requires measurement

*Modified and expanded from Whitaker (*Arch Pediatr Adolesc Med* 2003;157:725-7)

Treatment

Recent systematic reviews and critical appraisal exercises have consistently concluded that the evidence on interventions to treat paediatric obesity is extremely limited. Most of the randomised controlled trials have been methodologically weak and short term, and many have been unsuccessful. Most trials tested interventions that are unlikely to be generalisable. Systematic reviews have identified promising elements of treatment from the literature.

No high quality evidence is currently available on the medium to long term effects of surgical treatment, drug treatment, or residential treatment. Longer term randomised controlled trials of these forms of treatment are needed urgently.

Audits of typical dietetic and paediatric treatment of obesity in the US and in the UK usually report disappointing results. A recently conducted five year audit of an obesity clinic at the Royal Hospital for Sick Children in Edinburgh found that over half of the patients who had been referred to the clinic did not attend any of their appointments. Of the patients who attended at least one appointment, only 22% maintained their weight over six months.

Management

To know how to manage childhood obesity we need to know who should be treated, who should be referred, and what the treatment should aim for.

Systematic reviews and critical appraisals have concluded that the evidence base (from reports from expert committees) for providing answers to these questions is weak. Nevertheless, these reports are likely to be extremely helpful in management.

Summary of reports from expert committees

Who should be treated?

As treatment of obesity requires long term adherence to lifestyle changes, success is unlikely if patients and/or their family do not perceive obesity as a problem or if they are poorly motivated to make lifestyle changes.

The disappointing results of treatment from past audits partly reflect a lack of understanding among families that paediatric obesity matters. Treatment should be reserved for families who perceive obesity as a problem and who show motivation to make and sustain lifestyle changes.

Who should be referred?

Referral from primary to secondary care would be justified for two reasons: to investigate possible underlying pathological causes of the patient's obesity; and to investigate or manage a possible comorbid condition such as type 2 diabetes.

In the vast majority of patients obesity is caused by lifestyle; pathological causes are extremely rare. An underlying pathological cause should be suspected, however, if obesity is particularly severe in young children (where it may reflect an underlying genetic cause such as a single gene defect) or if it coexists with short stature (which may indicate a syndromic cause such as the Prader-Willi syndrome or some other endocrine cause).

If referral to secondary care reveals no comorbidities requiring urgent treatment and no underlying pathological causes of obesity, patients could be discharged to primary care for treatment. However, in many parts of the UK treatment of childhood obesity is either limited or not offered at all in primary or secondary care.

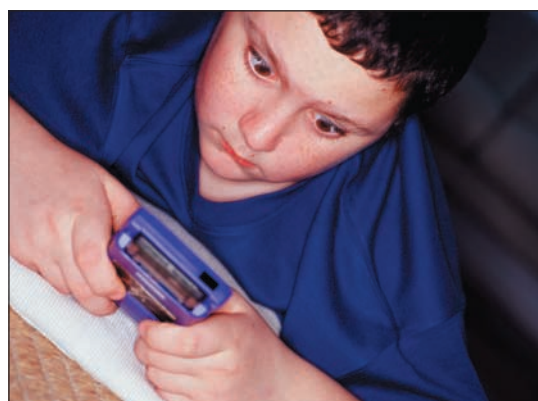
Useful tips when treating paediatric obesity

- Treat as "intensively" as possible—more frequent and longer appointments are beneficial
- Treat the whole family, not just the child
- Treat only motivated families
- Aim for dietary changes, perhaps using a "traffic light" approach—that is, greatly restrict foods high in energy ("red"); restrict foods with moderate energy content ("amber") to meal times only; eat freely foods that are low in energy ("green") and substitute them for red foods

The possibility of causing harm is also perceived by parents, teachers, and health professionals as a barrier to treatment, but the evidence suggests that this is unlikely. In fact, with some treatment interventions the psychosocial wellbeing of those being treated actually improved

Reports on management from expert committees

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Time spent playing computer games may need to be reduced if an obese child is to achieve and maintain weight loss

Families can measure television viewing and related sedentary behaviours; if they reduce their viewing, this may result in them also reducing their food intake and increasing their physical activity

What should treatment aim for?

Weight maintenance over six to 12 months is considered to be a success, particularly as continued excessive weight gain is common in the absence of treatment. Weight maintenance is also successful because, with growth, paediatric patients can to some extent “grow into their weight.”

Weight loss is an unrealistic aim except if patients have achieved prolonged weight maintenance or are severely obese and so have to lose weight to enable management of comorbidity such as type 2 diabetes or sleep apnoea. Progress with management should be reviewed with the family using the BMI centile chart periodically.

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The ABC of Obesity is edited by Naveed Sattar (nsattar@clinmed.gla.ac.uk), professor of metabolic medicine, and Mike Lean, professor of nutrition, University of Glasgow. The series will be published as a book by Blackwell Publishing in early 2007.

The ABC series—published by Blackwell Publishing

From January 2007, ABC articles will no longer be serialised in the *BMJ*, but Blackwell Publishing is delighted to continue the successful ABC book series. With over 40 titles, this series provides a dependable reference on a range of topics across the major specialties. For further details, please visit www.bmjbooks.com

Aims of treatment

- To resolve comorbidity if it is present
- To achieve weight maintenance, not weight loss
- To ensure that families monitor their own diet, activity, television viewing, and computer use
- To introduce dietary changes
- To reduce sedentary behaviour (particularly television viewing)—to less than two hours a day
- To increase physical activity through lifestyle changes such as walking to and from school

Further reading

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The photographs of adolescent girls and of a child playing a computer game are published with permission from Bubbles and Gusto/SPL respectively.

Competing interests: For series editors' competing interests, see the first article in this series.

BMJ 2006;333:1207-10

A memorable patient

The Swan Lady

It is 1946. A young woman is dying of breast cancer in a side street in Streatham. This is before the days of chemotherapy, and her radiotherapy has badly burnt and scarred her. The family doctor tells her distraught husband that there is no more he can do for her. “If they had not cut into the cancer, she might have survived.” A small girl overhears these words and never forgets them. The doctor leaves, and shortly the young woman dies, with little dignity as, in those days, morphine is used sparingly for fear of addiction.

Sixty years later, an elderly woman consults her oncologist. For seven years she has lived with breast cancer but has refused treatment. Her disease is now very advanced. She is beginning to lose her concentration, and, realising that her memory is becoming faulty, she decides she had better seek orthodox medical advice for the last time. I examine her and find a huge, fixed, offensive cancer of her left breast. Her liver is grossly enlarged. She is cachectic, and there are skin deposits on her back and abdomen. She dresses.

Back in the consulting room, I am surprised to find her a sophisticated and attractive lady, quite invisible as a patient behind her clothes. She has a gentle, cultured voice. I ask her what she used to do for a living. After being widowed early and childless, she had given educational lectures all around the country.

“What were they on?” I ask her.

“Many things, but mainly on swans.”

“What sort of swan?” I go on, fancying myself as a bit of an ornithologist.

“Mute swans,” she answers.

“And why swans?”

“Because swans are such elegant and beautiful creatures. They are greatly harmed by fishermen, and much maligned. They mate for life, take care of their young, and will fight and die for each other.”

There is nothing I can say. This perceptive, cultured, and sensitive woman has allowed her breast cancer to progress untreated for the past seven years, refusing all conventional treatment, because of what she overheard as a small child 60 years ago. Those words, spoken in ignorance but never doubted by her, were her death sentence, as lethal as any bullet.

What can we learn from the Swan Lady? To take care what we tell our patients and to remember the power our words can have. Sometimes our greatest strength, like the swan, is in silence.

Dick Ashford *consultant clinical oncologist, Mount Vernon Hospital, Chipperfield* (dickashford@doctors.org.uk)

We welcome articles up to 600 words on topics such as *A memorable patient*, *A paper that changed my practice*, *My most unfortunate mistake*, or any other piece conveying instruction, pathos, or humour. Please submit the article on <http://submit.bmj.com>. Permission is needed from the patient or a relative if an identifiable patient is referred to. We also welcome contributions for “Endpieces,” consisting of quotations of up to 80 words (but most are considerably shorter) from any source, ancient or modern, which have appealed to the reader.